

Compact High Pulse Energy Single Frequency Fiber Amplifier, Phase I Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



ABSTRACT

Atmospheric methane is the second most important anthropogenic greenhouse gas. The overtone lines of methane at 1.65 micron are well suited for remote sensing of atmospheric methane in the Earth's atmosphere. NASA have already demonstrated ground-based and airborne methane detection using Optical Parametric Amplifiers at 1651 nm using a laser with a narrow linewidth. In this setup a single frequency pulsed laser near 1 micron wavelength with several mJ pulse energy is needed. We propose to develop a compact pulsed single frequency fiber laser with greater than 3mJ pulse energy and 30ns pulse width using our innovative Yb-doping fiber. Highly efficient Yb doped glasses will be developed, double cladding fibers will be designed and fabricated, the amplifier performance will be characterized. In Phase II we will build a deliverable prototype high energy and high peak power fiber laser system for NASA.

ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: This proposed single frequency high energy and high peak power fiber laser can be used as innovative lidar component for measurements of the atmosphere and gas contents of the Earth, Mars, the Moon, and other planetary bodies. This laser can also be used for other wavelength generation. Because it is fiber based, this single frequency high energy and high peak power amplifier is compact, efficient, and extremely reliable.

To the commercial space industry:

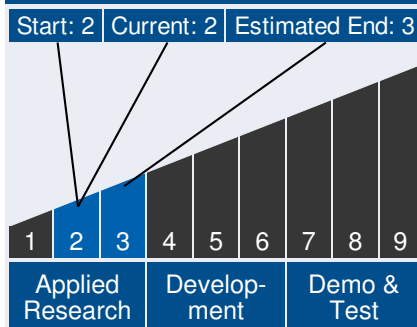
Potential Non-NASA Commercial Applications: There are a number of potential non-NASA commercial applications for high energy and high peak power fiber lasers and amplifiers. This laser source can be used to build commercial lidar for ranging and gas monitoring applications, and as the light source for optical sensing and scientific research. This laser can be used



Table of Contents

Abstract	1
Anticipated Benefits	1
Technology Maturity	1
Management Team	1
U.S. Work Locations and Key Partners	2
Image Gallery	2
Technology Areas	2
Details for Technology 1	3

Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

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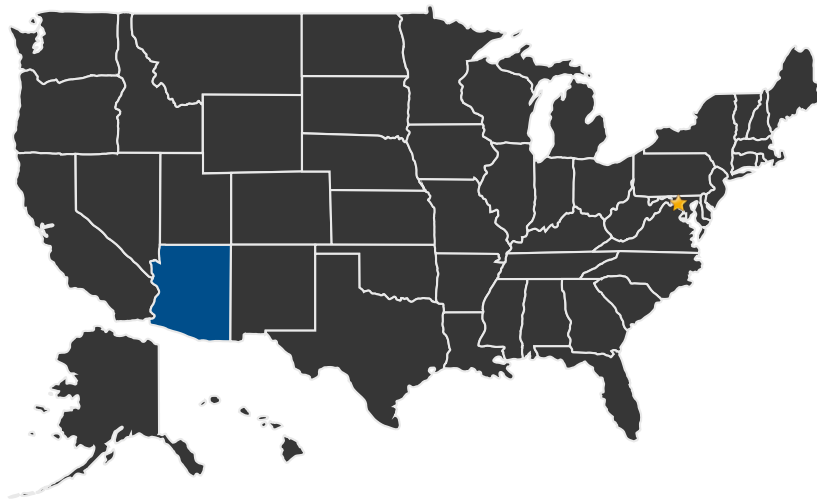
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to build single frequency green laser.

U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States
With Work

★ **Lead Center:**
Goddard Space Flight Center

Other Organizations Performing Work:

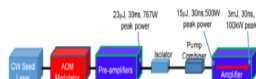
- AdValue Photonics, Inc. (Tucson, AZ)

PROJECT LIBRARY

Presentations

- Briefing Chart
 - (<http://techport.nasa.gov:80/file/23162>)

IMAGE GALLERY



*Compact High Pulse
Energy Single Frequency
Fiber Amplifier, Phase I*

Management Team (cont.)

Principal Investigator:

- Shibin Jiang

Technology Areas

Primary Technology Area:

Science Instruments,
Observatories, and Sensor
Systems (TA 8)

- └ Remote Sensing Instruments
and Sensors (TA 8.1)
 - └ Lasers (TA 8.1.5)

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DETAILS FOR TECHNOLOGY 1

Technology Title

Compact High Pulse Energy Single Frequency Fiber Amplifier, Phase I

Potential Applications

This proposed single frequency high energy and high peak power fiber laser can be used as innovative lidar component for measurements of the atmosphere and gas contents of the Earth, Mars, the Moon, and other planetary bodies. This laser can also be used for other wavelength generation. Because it is fiber based, this single frequency high energy and high peak power amplifier is compact, efficient, and extremely reliable.